

Plague

REPORT IMMEDIATELY

Section 1:

ABOUT THE DISEASE

A. Etiologic Agent

Plague is a zoonotic disease of rodents and their fleas caused by the bacterium *Yersinia pestis*.

B. Clinical Description

The initial signs and symptoms of plague in humans are usually nonspecific, and they include fever, chills, malaise, sore muscles (myalgia), nausea, sore throat, headaches, and weakness. Bubonic plague, the most common form of the disease, is a syndrome that includes painful swelling of lymph nodes. Pneumonic plague refers to a form of the illness affecting the lungs; septicemic plague is a form caused by disseminated infection through the blood stream. Meningeal plague, or plague affecting the membranes lining the brain and spinal cord, is a rare form of the disease. Both pneumonic and septicemic plague can be primary, or they can be secondary to another form of plague. Untreated bubonic plague is fatal in 50–60% of cases, while untreated primary septicemic and pneumonic plague are fatal in 100% of cases.

C. Vectors and Reservoirs

Certain wild rodents and their fleas carry *Y. pestis*. In the U.S., ground squirrels and prairie dogs are the primary reservoirs of *Y. pestis*. Lagomorphs (rabbits and hares), wild carnivores (meat-eating mammals), and domestic cats may also be a source of infection to people.

D. Modes of Transmission

Plague is acquired primarily through the bite of an infected flea or through inhalation of airborne *Y. pestis*, either through proximity to a human or animal case of pneumonic plague or by accidental exposure in a laboratory. Plague can also be acquired by handling tissues of infected animals or by being bitten or scratched by an infected animal.

E. Incubation Period

The incubation period for plague is from 1–7 days.

F. Period of Communicability or Infectious Period

Patients with pneumonic plague are considered infectious throughout their symptomatic illness and for 72 hours following initiation of effective antibiotic treatment. Discharge from lesions in patients with bubonic plague is considered infectious.

G. Epidemiology

Wild rodent plague exists in large areas of South America, Africa, Eastern Europe, and Asia. In 1994, an outbreak of pneumonic and bubonic plague occurred in Surat, India. In the U.S., wild rodent plague occurs primarily in ground squirrels and prairie dogs in the western part of the country. Human cases in the western U.S. occur sporadically,

usually following exposure to wild rodents or to their fleas. Approximately 10–15 people are diagnosed with plague each year in the U.S. During 1988–2002, 112 human cases of plague were reported from 11 western states. The majority of these cases (97 cases or 87%) were exposed in four states (New Mexico [48 cases], Colorado [22], Arizona [16], and California [11]). Person-to-person transmission has not been documented in the U.S. since 1925.

H. Bioterrorist Potential

Y. pestis is considered a Category A bioterrorist agent. If acquired and properly disseminated, *Y. pestis* could cause a serious public health challenge in terms of ability to limit the number of casualties and to control other effects from such an attack.



Section 2:

REPORTING CRITERIA AND LABORATORY TESTING

A. What to Report to the Massachusetts Department of Public Health (MDPH)

Report any suspicion of plague called to your attention by a human or animal health care provider or any positive laboratory result pertaining to plague. Also report any potential exposure to plague that may be related to bioterrorism.

Note: See Section 3C for information on how to report a case.

B. Laboratory Testing Services Available

The MDPH State Laboratory Institute (SLI), Bioterrorism Response Laboratory (BRL) provides testing services for clinical specimens for *Y. pestis*. Specimens are tested by culture. Acceptable specimens include blood, bronchial washes, transtracheal aspirates, and tissue aspirates. Laboratories can also submit isolates for identification or confirmatory testing. In addition, the BRL requests submission of all *Y. pestis* isolates for further testing for disease surveillance purposes. In certain circumstances, the SLI may also forward serology specimens for testing at the Centers for Disease Control and Prevention (CDC).

For more information on testing and specimen submission, call the BRL, any time of day or night, at (617) 590-6390. The BRL must be notified prior to specimen submission.



Section 3:

REPORTING RESPONSIBILITIES AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- ◆ To identify potential sources of transmission in the U.S. (such as wild rodents or other animals).
- ◆ To identify sources of transmission and geographical areas of risk outside of the U.S.
- ◆ To stop transmission from such sources.
- ◆ To identify cases and clusters of human illness that may be associated with bioterrorism.

B. Laboratory and Health Care Provider Reporting Requirements

Plague is reportable to the local board of health (LBOH). The MDPH requests that health care providers immediately report to the LBOH in the community where the case is diagnosed, all confirmed or suspect cases of plague, as defined by the reporting criteria in Section 2A.

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of *Y. pestis* infection shall immediately report such evidence of infection, directly by phone, to the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850.

For questions related to plague in animals or to report a suspect case of plague in an animal, contact the Massachusetts Department of Agricultural Resources (MDAR), Division of Animal Health, Dairy Services, and Biosecurity (DAH) at (617) 626-1795.

C. Local Board of Health (LBOH) Reporting and Follow-up Responsibilities

Reporting Requirements

MDPH regulations (*105 CMR 300.000*) stipulate that plague is reportable to the LBOH and that each LBOH must report any confirmed case of plague or suspect case of plague, as defined by the reporting criteria in Section 2A. Cases should be reported to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS) using a MDPH *Generic Confidential Case Report Form* (found at the end of this chapter). Refer to the *Local Board of Health Timeline* at the end of this manual's *Introduction* section for information on prioritization and timeliness requirements of reporting and case investigation.

Under *105 CMR 300.140, Reporting of Animal Diseases with Zoonotic Potential by Veterinarians*, any veterinarian or LBOH with knowledge of an animal disease potentially infectious to humans must also report the disease to the DAH. (Some specific diseases in animals that veterinarians must also report directly to MDPH are anthrax, plague, West Nile virus infection, and Eastern equine encephalitis virus infection.) For questions related to plague in animals or to report a suspect case of plague infection in an animal, contact the DAH at (617) 626-1795 or fax the information to the DAH at (617) 626-1850.

Case Investigation

If a LBOH learns of a suspect or confirmed case of plague or of a potential exposure that may be a bioterrorist incident, it should immediately call the MDPH, any time of day or night. The MDPH Division of Epidemiology and Immunization has coverage 24 hours a day, 7 days a week. An epidemiologist can be contacted by calling (617) 983-6800 or (888) 658-2850.

1. The MDPH Division of Epidemiology and Immunization will direct case investigation of plague in Massachusetts residents. If a bioterrorist event is suspected, the MDPH and other response agencies will work closely with the LBOH and will provide instruction/information on how to proceed.
2. Following immediate notification of the MDPH, the LBOH may be asked to assist in investigating cases that live within their communities, including gathering the following information:

- a. The case's name, age, address, phone number, status (hospitalized, at home, deceased), and parent/guardian information, if applicable.
 - b. The name and phone number of the hospital where the case is or was hospitalized.
 - c. The name and phone number of the attending physician.
 - d. The name and phone number of the infection control official at the hospital.
 - e. The name(s) and phone number(s) of other health care provider(s) seen by the case before hospitalization or of other hospital(s) at which the case was seen.
3. Following immediate notification of the MDPH, the LBOH may be asked to assist in completing an official MDPH *Generic Confidential Case Report Form* (found at the end of this chapter). Most of the information required on the form can be obtained from the health care provider or from the medical record. Use the following guidelines to assist in completing the form:
- a. Record the case's demographic information.
 - b. Accurately record clinical information including "plague" as the disease being investigated, the type of plague (e.g., bubonic, pneumonic, septicemic, meningial plague, or a combination of these), date of symptom onset, symptoms, whether hospitalized, and hospital and clinician contact information.
 - c. Include all available diagnostic laboratory test information.
 - d. Information relevant to prevention and control: Use the incubation period range for plague (1–7 days). Specifically, focus on the period beginning a minimum of one day prior to the case's onset date back to no more than seven days before onset for the following exposures:
 - i. Travel history: Determine the date(s) and geographic area(s).
 - ii. Animal contact: Ask the case about potential direct or indirect, occupational or recreational exposures to rodents. This information can be documented in the "Comments" section.
 - iii. Sick animals and/or laboratory work: For pneumonic plague, ask about exposures to sick animals and about possible laboratory exposures.
 - e. Include any additional comments regarding the case.
 - f. If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or health care provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason(s) why it could not be filled out completely.
4. After completing the form, attach laboratory report(s) and fax or mail (in an envelope marked "Confidential") to ISIS. The confidential fax number is (617) 983-6813. Call ISIS at (617) 983-6801 to confirm receipt of your fax. The mailing address is:

MDPH, Office of Integrated Surveillance and Informatics Services (ISIS)
305 South Street, 5th Floor
Jamaica Plain, MA 02130
Fax: (617) 983-6813

5. Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LBOH to understand, and if necessary, institute the control guidelines listed in Section 4.



Section 4:

CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (*150 CMR 300.200*)

Minimum Period of Isolation of Patient

Droplet and contact precautions, in addition to standard precautions, are indicated for patients with plague until pneumonia is excluded and appropriate antibiotic therapy has been initiated. For patients with pneumonic plague, droplet precautions should be maintained for 72 hours after initiation of effective antibiotic therapy. For patients with bubonic plague, the case should be placed on contact precautions until 48 hours after initiation of effective therapy.

Minimum Period of Quarantine of Contacts

Contacts of cases of pneumonic plague should receive prophylaxis and should be placed under personal surveillance for seven days; those who refuse prophylaxis shall be placed in strict quarantine for seven days.

B. Protection of Contacts of a Case

Cases with pneumonic plague are considered infectious throughout their symptomatic illness and for 72 hours following initiation of effective antibiotic treatment. Any persons who have been in household or face-to-face contact with a case with pneumonic plague during the infectious period should be referred to their health care provider for antibiotic prophylaxis and should be placed under symptom surveillance for seven days. If a contact of a pneumonic plague case is unable to receive antibiotic prophylaxis, he/she should be placed under strict quarantine for a seven-day period. Bubonic plague is generally not transmitted from person to person.

C. Managing Special Situations

Reported Incidence Is Higher Than Usual/Outbreak Suspected

If the number of cases of plague in your city/town is higher than usual or if you suspect an outbreak, contact the MDPH immediately and investigate to determine the source of infection and the mode of transmission (e.g., contact with diseased rodents). Cases of plague in Massachusetts are most commonly associated with travel to the western part of the U.S. or to another country with a known outbreak. Contact the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850 as soon as possible. The Division can help determine a course of action to prevent further cases and can perform surveillance for cases across town lines, which would otherwise be difficult to identify at the local level.

If a bioterrorism incident is suspected, the MDPH and other response agencies will work closely with LBOH and will provide instructions/information on how to proceed.

D. Preventive Measures

Personal Preventive Measures/Education

To avoid cases of plague, people should reduce the likelihood of being bitten by infected fleas or of being exposed to patients with pneumonic plague by:

- ◆ Understanding the modes of transmission of plague and heeding any plague advisories while visiting the southwestern U.S. or other parts of the world.
- ◆ Preventing rodent access to food and shelter by ensuring appropriate storage and disposal of food, garbage, and refuse.
- ◆ Using insect repellents while camping in rural plague-infected areas, and reporting dead or sick animals to park rangers or public health authorities.
- ◆ Preventing flea infestation of dogs and cats.
- ◆ Avoiding unnecessary contact with rodents or lagomorphs, and using protective gloves if handling is necessary.

A vaccine for *Y. pestis* is no longer available in the U.S.

National and International Travel

For more information regarding national/international travel and plague, contact the CDC's Traveler's Health Office at (877) 394-8747 or through the CDC website at www.cdc.gov/travel.

A Plague Public Health Fact Sheet is available from the MDPH Division of Epidemiology and Immunization or on the MDPH website at www.mass.gov/dph. Click on the "Publications and Statistics" link, and select the "Public Health Fact Sheets" section under "Communicable Disease Control."



ADDITIONAL INFORMATION

The following is the formal CDC surveillance case definition for plague. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the MDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting to the MDPH, always use the criteria outlined in Section 2A.

Note: The most up-to-date CDC case definitions are available on the CDC website at www.cdc.gov/epo/dphsi/casedef/case_definitions.htm.

Clinical Description

- ◆ Regional lymphadenitis (bubonic plague);

- ◆ Septicemia without an evident bubo (septicemic plague); and
- ◆ Plague pneumonia, resulting from hematogenous spread in bubonic or septicemic cases (secondary pneumonic plague) or inhalation of infectious droplets (primary pneumonic plague).

Laboratory Criteria for Diagnosis

Presumptive

- ◆ Elevated serum antibody titer(s) to *Y. pestis* fraction 1 (F1) antigen (without documented four-fold or greater change) in a patient with no history of plague vaccination; or
- ◆ Detection of F1 antigen in a clinical specimen by fluorescent assay.

Confirmatory

- ◆ Isolation of *Y. pestis* from a clinical specimen; or
- ◆ Four-fold or greater change in serum antibody titer to *Y. pestis* F1 antigen.

Case Classification

Suspect	A clinically compatible case without presumptive or confirmatory laboratory results.
Probable	A clinically compatible case with presumptive laboratory results.
Confirmed	A clinically compatible case with confirmatory laboratory results.



REFERENCES

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CDC. Case Definitions for Infectious Conditions Under Public Health Surveillance. *MMWR*. 1997; 46(RR-10).

CDC. Imported Plague—New York City, 2002. *MMWR*. 2003; 52: 725–728.

Heymann, D., ed. *Control of Communicable Diseases Manual, 18th Edition*. Washington, DC, American Public Health Association, 2004.

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FORMS & WORKSHEETS

Plague

Plague

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LBOH Action Steps

This form does not need to be submitted to the MDPH with the case report form. It is for LBOH use and is meant as a quick-reference guide to plague case investigation activities.

LBOH staff should follow these steps when plague is suspected in the community or if any communications are received which might convey a bioterrorism threat or attack. For more detailed information, including disease epidemiology, reporting, case investigation, and follow-up, refer to the preceding chapter.

Note: Case investigation of plague in Massachusetts residents will be directed by the MDPH Division of Epidemiology and Immunization. If a bioterrorist event is suspected, the MDPH and other response authorities will work closely with LBOH and will provide instructions/information on how to proceed.

- ☐ Immediately notify the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850, to report all confirmed or suspect case(s) of plague.
- ☐ To report a case or suspect case of plague in an animal, contact the Massachusetts Department of Agricultural Resources (MDAR), Division of Animal Health, Dairy Services, and Biosecurity (DAH) at (617) 626-1795 or fax the information to the DAH at (617) 626-1850.
- ☐ Obtain laboratory confirmation.
- ☐ Identify other potentially exposed persons.
- ☐ Fill out the case report form (attach laboratory results).
- ☐ Work with MDPH to institute isolation and quarantine requirements (*105 CMR 300.200*), as they apply to a particular case.
- ☐ Send the completed case report form (with laboratory results) to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS).